



## Twelve tips on writing a discussion case that facilitates teaching and engages learners

David A. Cohen, Lori R. Newman & Laurie N. Fishman

**To cite this article:** David A. Cohen, Lori R. Newman & Laurie N. Fishman (2016): Twelve tips on writing a discussion case that facilitates teaching and engages learners, *Medical Teacher*, DOI: [10.1080/0142159X.2017.1266315](https://doi.org/10.1080/0142159X.2017.1266315)

**To link to this article:** <http://dx.doi.org/10.1080/0142159X.2017.1266315>



Published online: 26 Dec 2016.



Submit your article to this journal [↗](#)



View related articles [↗](#)



View Crossmark data [↗](#)

TWELVE TIPS

## Twelve tips on writing a discussion case that facilitates teaching and engages learners

David A. Cohen<sup>a</sup>, Lori R. Newman<sup>b</sup> and Laurie N. Fishman<sup>c</sup>

<sup>a</sup>Department of Internal Medicine, Beth Israel Deaconess Medical Center, Harvard Medical School, Harvard, MA, USA; <sup>b</sup>Department of Medical Education, Boston Children's Hospital, Harvard Medical School, Boston, MA, USA; <sup>c</sup>Department of Pediatrics, Boston Children's Hospital, Harvard Medical School, Boston, MA, USA

### ABSTRACT

The authors share twelve practical tips on writing a case that engages learners in active learning and discussion. They first advise that, during the initial preparation of the case, authors should (1) identify the case goals and objectives, and (2) identify the level of the learners. When writing the case, authors should (3) use active and colorful language; (4) use patients' own descriptions rather than medical language; (5) allow the learners to interpret data themselves; (6) allow for natural discovery rather than presenting information chronologically; and (7) be realistic about interruptions in patient care. In addition, case authors should pay attention to methods that enhance discussion by (8) creating barriers to diagnostic or treatment options; (9) promoting questions and discussion over answers; (10) using cues to assure discussion flow and knowledge exploration; and (11) omitting details or inserting informational distractors. Finally, well-crafted questions are essential during the case presentation to engage learners in higher-order thinking; and to (12) stimulate curiosity and reflection.

### Introduction

Discussion sessions based on clinical cases are well known to promote active learning, critical thinking, and higher-order processing. However, if the case is poorly written, then the session can be difficult to lead and met with silence rather than rich learner engagement. A well-constructed case can serve as an instructional journey – once a facilitator introduces the case to the learners, the patient's history, pathophysiology, decision making, and complications unfold as the group navigates the case's road map.

While literature exists describing how to lead a case-based discussion (Irby 1994; Mehta et al. 2013), there are few publications on how to write medical cases that stimulate learner curiosity, peer-to-peer learning, productive debate, and the transfer and application of learning outcomes to realistic settings (Azer et al. 2012; Kim et al. 2006; Bowe et al. 2009). Too often, the standard format of a clinical presentation – a simple, chronological reporting of the patient history, physical examination, laboratory data, summary, and assessment – is used to write a case without thought of how it will impact student interest, application of knowledge, and learning outcomes.

Based on two decades of experience leading discussions and a thorough review of the medical education and higher education literature, we present practical tips for creating realistic cases that guide learners toward meaningful learning that can be readily applied to actual clinical practice. Anticipating the way learners will react to a case can help focus attention, spur curiosity, and challenge current ways of thinking – all elements that invite discussion. Thoughtful preparation ensures the case-based discussion will lead learners toward the identified educational objectives and will challenge them to engage in higher-order

cognitive processing such as knowledge application, analysis, synthesis, and evaluation.

### Case preparation

#### Tip 1

##### *Start with the end in mind*

In his book *Basic Principles of Curriculum and Instruction*, Ralph Tyler (1949), one of the first educators to stress the importance of focusing on learners and their experiences, presented a model that has become the basis for current day curricular design. Among its core components, Tyler's model stresses the importance of identifying measurable objectives of the learning experience and organizing learning activities to meet those objectives (p. 1). In the 1990s, Ronald Harden and his colleagues (Harden et al. 1999) applied this model to medical education, calling it "outcome-based education." They advocated for a "design down" approach, in which the educational program's precisely stated outcomes are first developed by the educator. It is only after this initial step of identifying the goals and objectives, can the actual teaching session be written.

Following this approach, case authors should first identify the main goals and objectives of the case before deciding about presentation of the patient's history and problem list (Azer 2007). For example, the author of a case on adenocarcinoma of an unknown primary site should first decide whether the focus of the discussion should be on development of the differential diagnosis, understanding disease treatment, or enhancing patient communication. Furthermore, the author should choose two to three objectives for the case that align with the goals. These objectives

describe the knowledge, skills, and/or behaviors learners will be able to demonstrate at the completion of the case discussion. The acronym *SMART* describes the key components of effective objectives: Specific, Measurable, Attainable, Relevant, and Targeted (Drucker 1954; Doran et al. 1981; Brodsky & Newman 2011). In the above-mentioned case, an appropriate learning objective might be “By the end of the case-based teaching session, the internal medicine resident will list three immunochemistry stains that may be useful in determining the primary site of an adenocarcinoma of unknown primary site.”

## Tip 2

### *Identify the learners’ level of knowledge*

To write a case that promotes learners’ ability to transfer information gained from the in-class discussion to authentic clinical scenarios, the author should first identify the intended learners’ level of knowledge. By “diagnosing” learners, the content of the case and the subsequent discussion are targeted to the appropriate knowledge and skill levels (Beckman & Lee 2009), facilitating movement from novice to mastery (Dreyfus & Dreyfus 1988; Benner 2004).

For example, straightforward “textbook” case histories and physical symptoms are helpful for medical students to recognize the patterns of common presentations. For more advanced learners, mixed symptoms and inconclusive signs allow for exploration of a broader range of possibilities, while engaging in higher-order thinking and questioning. Aiming the case at too low a level can feel insulting; conversely, overestimating learners’ understanding might increase their confusion.

## **Writing the case, Part 1: bring realism to the content**

## Tip 3

### *Use active and colorful language to create realistic cases*

One principle of Knowles’ adult learning theory is that learning is more effective when adults are faced with subjects that are realistic and relevant (Knowles et al. 1984; Hatem 2003). Studies have also shown that the use of vivid language and semantic cues enhances recall (Frost 1972; Kensinger & Corkin 2003). Moreover, we know from the literature, as well as from our own experience, that active learning creates an exciting educational environment that enhances the instructional experience (Barrows & Tamblyn 1980; Bonwell & Eison 1991; Brown et al. 2014). Simple techniques, such as naming the patient, make the case more realistic, personal, and relatable. Giving the patient a unique occupation, such as a theater set designer or a greeting card artist, generates interest. Using germane descriptions will make the case more approachable and memorable. For example, “Mrs. Hathaway finds it difficult to grasp the wooden handle of the broom at her janitorial employ,” “Mr. Okulaja suddenly loses his taste for expensive Bordeaux,” or “Juan-Carlos choked on a frankfurter at the ballpark.” The use of active and colorful language, as in these examples, supports creation of a mental model for

learners and triggers knowledge recall during future clinical practice (Berliner 1994; Azer et al. 2012)

## Tip 4

### *Describe symptoms the way patients present them*

George Engel (1973) called the medical interview “the most powerful and sensitive and most versatile instrument available to the physician.” We may rely more on imaging and laboratory results than we did years ago, but a good history can provide the diagnosis in 76% of cases (Peterson et al. 1992). When writing cases, we do much more than convey factual information, we also teach our readers about the importance of communication, history taking, and the lost art of listening.

Patients do not use medical terminology; rather they use common lay terms to describe their signs and symptoms (Haidet & Paterniti 2003; Williams & Simel 2009; Henry et al. 2013). For example, a middle-aged man with rabies would not complain of “hydrophobia,” but will tell his doctor that he is having nightmares about water. A young man will not describe “progressive dysphagia,” but will admit that over the last few months bread has begun to stick in his throat more and more. A young woman who refuses to roll up her blouse sleeve may be hiding marks of abuse. Such real-world presentations will increase transfer of learning from case reading and discussion to the practice of medicine.

Genuine, clinically relevant signs and symptoms enhance case authenticity and student interest (Thomas 1992; Kim et al. 2006; Azer et al. 2012). In the cases that we write, we treat the patients as real persons (“A 75-year-old female court stenographer with late-onset autoimmune diabetes mellitus of adulthood”), to prevent our learners from seeing the patient as simply a manifestation of a disease (“A 75-year-old diabetic”) (Glick & Armstrong 1996).

## Tip 5

### *Present laboratory or radiographic data without interpretation*

In 1949, Benjamin Bloom spearheaded a group of educators to attempt a classification of educational goals and objectives, hoping to improve curriculum design and subsequent learning. After seven years of work, they published a handbook on the first of the three domains, called “Bloom’s Taxonomy.” This text focused on the cognitive domain, hierarchically arranging thinking along six levels of increasing complexity and difficulty. The skills in this domain revolve around knowledge, comprehension, and critical thinking (Bloom & Krathwohl 1956). The use of Bloom’s higher-order thinking can promote lasting learning. The highest taxonomy level, evaluation, involves interpretation about the value of ideas or materials, in which the learner communicates the significance of analyzed information, rather than simply relaying facts.

While experienced clinicians can sometimes rely on intuition to assist when encountering a complex clinical problem, novice learners need to approach the same problem in a more analytical and inductive manner (Harasym et al. 2008; Crosskerry 2009). It is important that we not deprive

our learners of opportunities for higher-order thinking, problem-solving, and decision-making by merely presenting information and interpreting it for them. We suggest disclosing the factual pieces of information from the history as well as laboratory or radiographic data without interpretation, allowing the learners to synthesize and judge the importance or relevance. They can then use the information to alter their hypothesis and interrelate it with other available information (Barrows & Tamblyn 1980; Koh et al. 2008).

For example, a case about a patient with malabsorption and a rash may simply present the tissue transglutaminase levels and a picture of the rash. With this limited data and a single image, learners will begin to evaluate the material provided, draw on previous learning and experience, and devise a rationale why the patient may or may not have celiac disease. Rather than stating that a patient who presented with syncope was found to have atrial fibrillation, a case author might include an actual ECG with an irregularly irregular rhythm. Taking this a step further, the author can provide values that must be interpreted beyond simple memorization of the normal range. For example, an inappropriately normal PTH in the setting of hypercalcemia is still hyperparathyroidism, and a heart rate of 46 in a resting athlete may be perfectly healthy. Presenting realistic ambiguity can lead to debate and rich discussion for the more sophisticated learner group (Bowe et al. 2009).

## Tip 6

### *Do not be a slave to chronology*

Cases constructed from realistic patient presentations engage learners in a discovery process that emulates authentic clinical decision making. Patients rarely, if ever, present their clinical history in an accurate recollection of findings, diagnoses, and treatment regimens. More commonly, critical information is forgotten and historical data is presented out of chronological order (Newell et al. 1999). Similarly, when writing a case, it is best not to report a succinct chronology of events, which might reveal the underlying diagnosis too early in the discussion. Rather, as the case progresses, the patient might recall new information from the history or laboratory results may become available, allowing learners to practice incorporating new information into their clinical reasoning (Eshach & Bitterman 2003; Kim et al. 2006; Azer et al. 2012).

For example, a 16-year-old female patient presenting with a small bowel obstruction can lead to a discussion of the possible etiologies of the condition. After the patient's parent provides additional circumstances, the chart is finally brought to the office from the Records Department, or the referring physician faxes the pathology images, the case unfolds and reveals that the patient was diagnosed with Crohn's disease three years prior. This additional historical detail could lead to a new discussion, perhaps about disease progression and management. Similarly, discovering a patient who initially presented with fatigue and flu-like illness was exposed to radiation at a young age can compel learners to incorporate this new information in their differential diagnosis and develop new hypotheses.

## Tip 7

### *Lose your patient to follow-up*

Patients do not always return for follow-up appointments; this is an unfortunate reality in today's healthcare delivery system (Kaplan-Lewis & Percac-Lima 2013; Samuels et al. 2015). Incorporating this common occurrence into the case presents the learners with a complex, real-world scenario. It also forces them to confront gaps in knowledge – a key step in critical thinking and problem solving. Losing a patient to follow-up allows exploration of how an untreated disease naturally progresses without close monitoring and ideal treatment. By skipping ahead, the patient can re-present to show the end stage of disease. Alternatively, the patient might appear at a different location, such as an emergency department in another hospital. This added detail allows for discussion of the difficulties of treating a patient without access to the medical history or potential problems when communicating across institutions.

## Writing the case, Part 2: develop the case flow and enhance discussion

## Tip 8

### *Create challenges to elicit multiple diagnostic or treatment options*

It may be difficult to elicit a robust discussion about options when a single medical treatment or test is standard, such as penicillin for streptococcal pharyngitis. But creating an educational challenge, such as a penicillin allergy, will force learners to discuss the next level of therapy. The process of embedding well-placed barriers in a case can layer multiple options for discussion of management (Kim et al. 2006; Azer 2007; Azer et al. 2012). For example, rather than presenting the best treatment options for a patient with dyslipidemia, a case could describe a patient who refuses medications due to anxiety about side effects and will only agree to a dietary approach to manage his cholesterol. Similarly, insurance companies may refuse to pay for an expensive medication so an alternative medication has to be prescribed. Other challenges that can lead to rich discussions include medication interactions, patient inability to attend frequent doctor visits for drug monitoring, current vaccination shortage, or difficult drug administration such as the need for self-injection (Bayoumi & Kopplin 2002). The juxtaposition of several treatment modalities allows comparisons about efficacy, encourages discussion about shared decision making with the patient, and provides the opportunity to teach about socio-economic barriers to health services, high-value care, and cost containment.

## Tip 9

### *Avoid the answer*

If a case is written with readily available information, novice learners may prioritize content and facts over analysis and problem solving, and subsequently jump to a clinical

conclusion. This mental shortcut, referred to as the “availability heuristic” in Jerome Groopman’s (2007) book *How Doctor’s Think*, often leads to errors in medical decision-making and execution. Alternatively, presenting a case that calls for diagnostic reasoning, problem solving, and clinical reasoning is much more likely to enhance development of lasting knowledge (Huang et al. 2014).

In writing a case, the revelation of clinical content should match intended instructional goals and objectives (Kim et al. 2006). In a case where the differential diagnosis is the main point of the discussion, discovery is encouraged throughout the case until there is closure on fundamental learning points. Alternatively, if the focus is on diagnostics or treatment, postponing the naming of the ideal test or medication will more likely engage students in debate, discussion, and exploration of clinical ambiguity (Srinivasan et al. 2007). These delays will allow the discussion to develop naturally, and spur learners to use their problem solving abilities to decide what is optimal for the patient’s particular situation (Bayoumi & Kopplin 2002). Similarly, having a patient seek a second opinion from an outside hospital introduces additional tests or treatments without implied endorsement. Subsequent discussion on clinical and diagnostic reasoning can revolve around whether the other institution performed the best available test, gave the right medication, or made the correct diagnosis. Encouragement of such analytical and evaluation skills is essential to enhancing critical thinking in our learners (Bowen 2006).

#### Tip 10

##### ***Allow exploration to direct the discussion through the case***

Problem-based learning (PBL) is a student-centered pedagogy in which learners gradually elucidate answers to their own questions as the case is revealed in a stepwise fashion. Compared with traditional pedagogical curricula, PBL has been shown to enhance learner interest, knowledge retention, concept transfer and integration, and self-directed learning skills (Azer et al. 2012). When appropriately presented, a PBL case encourages active learning and discovery of knowledge limits and promotes development of critical thinking skills (Barrows & Tamblyn 1980; Sendağ & Ferhan Odabasli 2009).

Because the learners (not the facilitator) lead the discussion in PBL, a well-written case is needed to help students along the proper path of intellectual exploration and prevent them from tangential thinking or premature termination of discussion. Inserting properly placed breaks in the case allows time for the learners to analyze and discuss new information in their own words – a learning technique called “elaboration,” as presented in *Make it Stick* (Brown et al. 2014). The author can create such pauses by cutting the patient history short or by weaving new history into the case, such as by stating: “The patient decided to go home to discuss the chemotherapy options with his family.” An embedded pause allows the learners to connect new information (the patient history) to established knowledge (what is already known about the disease process), making the material more durable and memorable.

#### Tip 11

##### ***Use missing information and distractors to provoke discussion***

Historically, medical cases were written with a rendering of all necessary information, followed by questions (Schuwirth et al. 1999). However, we advocate for occasionally leaving out a detail in the history or using a distractor to promote active engagement with the case. Similar to authentic clinical practice, medical information is rarely revealed in an easy-to-follow roadmap. Students should become accustomed to receiving, analyzing, and logically processing misleading or irrelevant data (Oyler & Romanelli 2014). It can be useful to include missteps such as having the family give their son aspirin before surgery, having the patient take antihistamines before allergy skin testing, or having X-rays lost during transport. Cases that model everyday reality can show students that clinicians often have to make decisions without having all information at hand. Furthermore, intentionally leaving out a detail such as the patient’s age can prompt exploration of how clinicians think differently about lower abdominal pain in a 14-year-old female as opposed to a 92-year-old male. Such omissions have additional benefits as learners’ analyses during a case discussion will likely increase their understanding of system-based and practice-based competencies. Furthermore, grappling with these everyday occurrences may improve learners’ coping mechanisms when presented with similar situations in the future (Ziv et al. 2005).

#### Tip 12

##### ***Prepare optional questions to probe students’ understanding***

A well-phrased question can capture students’ attention, spark their curiosity, highlight important points, and ignite student reflection. Learners’ responses to questions reveal their perceptions and comprehension of the case, their level of experience with the diagnosis or treatment plan, as well as their attitudes about the topic in general. We encourage case authors to consider preparing a list of optional questions to help learners engage in higher-order thinking such as application, synthesis, analysis, and evaluation (Bloom & Krathwohl, 1956; Bowen 2006). It is important to note, however, that these questions should not be explicitly embedded in the case. Rather, they should be made available in a facilitator’s guide with clear instruction that these questions are not seen as a prescriptive requirement (Azer 2012).

If optional questions are provided, then they should be phrased to stimulate learners to move beyond reciting basic facts from previously learned materials; rather, questions should encourage learners to think out loud and apply knowledge to the case at hand (Huang et al. 2016). Sample questions used might include the following:

- What aspects of this patient’s history make you most concerned?
- How would your hypothesis be affected if the patient has diabetes mellitus or is pregnant?
- Would your treatment recommendation change if the patient was homeless?

- What surprised you about that case?
- What is one thing you have learned from this case?
- Would providers from other countries have a different approach?

## Conclusion

Case-based discussions have tremendous potential to encourage active learning and critical thinking, at all educational levels and situations – from students to fellows-in-training and from the classroom to the bedside. Before writing the case, it is essential to delineate the goals and identify teaching points appropriate to the learners' knowledge level, thereby encouraging meaningful in-class discussion. Using vivid but realistic imagery can stimulate learners' interest and make the case easier to recall when faced with similar situations in actual clinical practice. Deliberately omitting data, employing unusual chronology, or including barriers to care can lead to rich discussions that stimulate curiosity and prompt learner-initiated questions.

After writing a draft of a case, it is best to have a colleague or a group of learners vet the material to check for accuracy, flow, and attainment of intended learning goals and objectives. We hope these tips can help facilitators create thoughtful cases that promote effective and meaningful learning outcomes.

## Disclosure statement

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

## Notes on contributors

**David A. Cohen**, MD, ECNU, is a practicing adult endocrinologist and Core Educational Faculty, Beth Israel Deaconess Medical Center, Boston, MA; Instructor of Medicine, Harvard Medical School, Boston, MA; co-director of the Beth Israel Deaconess Medical Center Academy of Medical Educators; and a graduate of the Rabkin Fellowship in Medical Education, Harvard Medical School, Boston, MA.

**Lori R. Newman**, MEd, is the director of professional development in medical education at Boston Children's Hospital, Boston, MA; Principal Associate in Pediatrics, Harvard Medical School, Boston, MA; and co-director of the Academy for Teaching and Educational Innovation and Scholarship, Boston Children's Hospital, Boston, MA.

**Laurie N. Fishman**, MD, is a practicing pediatric gastroenterologist and Director of Medical Education in Gastroenterology, Boston Children's Hospital, Boston, MA; Assistant Professor of Pediatrics, Harvard Medical School, Boston, MA; member of the Gastroenterology SubBoard of the American Board of Pediatrics; and a graduate of the Rabkin Fellowship in Medical Education, Harvard Medical School, Boston, MA.

## References

- Azer SA. 2007. Twelve tips for creating trigger images for problem-based learning cases. *Med Teach*. 29:93–97.
- Azer SA, Peterson R, Guerrero APS, Edgren G. 2012. Twelve tips for constructing problem-based learning cases. *Med Teach*. 34:361–367.
- Barrows HS, Tamblyn RM. 1980. *Problem-based learning: an approach to medical education*. New York (NY): Springer.
- Bayoumi AM, Kopplin PA. 2002. The storied case report. *CMAJ* 171:569–570.
- Beckman TJ, Lee MC. 2009. Proposal for a collaborative approach to clinical teaching. *Mayo Clin Proc*. 84:339–344.
- Benner P. 2004. Using the Dreyfus model of skill acquisition to describe and interpret skill acquisition and clinical judgment in nursing practice and education. *Bull Sci Technol Soc*. 24:188–199.
- Berliner DC. 1994. Expertise: the wonders of exemplary performance. In: Mangieri JN, Collins Block C, editors. *Creating powerful thinking in teachers and students*. Ft. Worth (TX): Holt, Rinehart and Winston.
- Bloom BS, Krathwohl DR. 1956. *Taxonomy of educational objectives: the classification of educational goals by a committee of college and university examiners. Handbook 1: cognitive domain*. New York (NY): Longmans.
- Bonwell C, Eison J. 1991. *Active learning: creating excitement in the classroom*. AEHE-ERIC higher education report no. 1. Washington (DC): Jossey-Bass.
- Bowe CM, Voss J, Thomas Aretz H. 2009. Case method teaching: an effective approach to integrate the basic and clinical sciences in the preclinical medical curriculum. *Med Teach*. 31:834–841.
- Bowen JL. 2006. Educational strategies to promote clinical diagnostic reasoning. *N Engl J Med*. 355:2217–2225.
- Brodsky D, Newman LR. 2011. A systematic approach to curriculum development. *NeoReviews* 12:e2–e7.
- Brown PC, Roediger III HL, McDaniel MA. 2014. *Make it stick: the science of successful learning*. Cambridge (MA): The Belknap Press of Harvard University Press.
- Crosskerry P. 2009. A universal model of diagnostic reasoning. *Acad Med*. 84:1022–1028.
- Doran G, Miller A, Cunningham J. 1981. There's a SMART way to write management goals and objectives. *Manage Rev*. 70:35–36.
- Dreyfus HL, Dreyfus SE. 1988. *Mind over machine*. New York (NY): Free Press.
- Drucker P. 1954. *The practice of management*. New York (NY): Harper & Row.
- Easton G. 2016. How medical teachers use narratives in lectures: a qualitative study. *BMC Med Educ*. 16:3. doi: 10.1186/s12909-015-0498-8.
- Engel GL. 1973. Enduring attributes of medicine relevant for the education of the physician. *Ann Intern Med*. 78:587–593.
- Eshach H, Bitterman H. 2003. From case-based reasoning to problem-based learning. *Acad Med*. 78:491–496.
- Eurell JAC, Lichtensteiger CA, Kingston SK, Diamond NA, Miller GY. 1999. Clinical cases as a teaching tool in veterinary histology. *J Vet Med Educ*. 26:1–6.
- Frost N. 1972. Encoding and retrieval in visual memory tasks. *J Exp Psychol*. 95:317–326.
- Glick T, Armstrong EG. 1996. Crafting cases for problem-based learning: experience in a neuroscience course. *Med Educ*. 30:24–30.
- Groopman JE. 2007. *How doctors think*. Boston (MA): Houghton Mifflin.
- Haidet P, Paterniti DA. 2003. "Building" a history rather than "taking" one: a perspective on information sharing during the medical interview. *Arch Intern Med*. 163:1134–1140.
- Harden RM, Crosby JR, Davis M. 1999. An introduction to outcome-based education. *Med Teach*. 21:7–14.
- Harasym PH, Tsai TC, Hemmati P. 2008. Current trends in developing medical students' critical thinking abilities. *Kaohsiung J Med Sci*. 24:341–355.
- Hatem CJ. 2003. Teaching approaches that reflect and promote professionalism. *Acad Med*. 78:709–713.
- Henry SG, Holmboe ES, Frankel RM. 2013. Evidence-based competencies for improving communication skills in graduate medical education: a review with suggestions for implementation. *Med Teach*. 35:395–403.
- Huang GC, Lindell D, Jaffe LE, Sullivan AM. 2016. A multi-site study of strategies to teach critical thinking: 'why do you think that?' *Med Educ*. 50:236–249.
- Huang GC, Newman LR, Schwartzstein RM. 2014. Critical thinking in health professions education: summary and consensus statements of the Millennium Conference 2011. *Teach Learn Med*. 26:95–102.
- Irby DM. 1994. Three exemplary models of case-based teaching. *Acad Med*. 69:947–953.
- Kaplan-Lewis E, Percac-Lima S. 2013. No-show to primary care appointments: why patients do not come. *J Prim Care Community Health* 4:251–255.

- Kensinger EA, Corkin S. 2003. Memory enhancement for emotional words: are emotional words more vividly remembered than neutral words? *Mem Cogn*. 31:1169–1180.
- Kim S, Phillips WR, Pinsky L, Brock D, Phillips K, Keary J. 2006. A conceptual framework for developing teaching cases: a review and synthesis of the literature across disciplines. *Med Educ*. 40:867–876.
- Knowles MS. 1984. *Andragogy in action: applying modern principles of adult education*. San Francisco (CA): Jossey Bass.
- Koh GCH, Khoo HE, Wong ML, Koh D. 2008. The effects of problem-based learning during medical school on physician competency: a systematic review. *CMAJ*. 178:34–41.
- Mehta F, Brown J, Shaw NJ. 2013. Do trainees value feedback in case-based discussion assessments? *Med Teach*. 35:e1166–e1172.
- Newell SA, Girgis A, Sanson-Fisher RW, Savolainen NJ. 1999. The accuracy of self-reported health behaviors and risk factors relating to cancer and cardiovascular disease in the general population: a critical review. *Am J Prev Med*. 17:211–229.
- Oyler DR, Romanelli F. 2014. The fact of ignorance: revisiting the Socratic method as a tool for teaching critical thinking. *Am J Pharm Educ*. 78:Article 144.
- Peterson MC, Holbrook JH, Von Hales D, Smith NL, Staker LV. 1992. Contributions of the history, physical examination, and laboratory investigation in making medical diagnoses. *West J Med*. 156:163–165.
- Samuels RC, Ward VL, Melvin P, Macht-Greenberg M, Wenren LM, Yi J, Massey G, Cox JE. 2015. Missed appointments: factors contributing to high no-show rates in an urban pediatrics primary care clinic. *Clin Pediatr*. 54:976–982.
- Schuwirth LWT, Blackmore DE, Mom E, Van den Wildenberg F, Stoffers HEJH, Van der Vleuten CPM. 1999. How to write short cases for assessing problem-solving skills. *Med Teach*. 21:144–150.
- Sendağ S, Ferhan Odabaslı H. 2009. Effects of an online problem based learning course on content knowledge acquisition and critical thinking skills. *Comput Educ*. 53:132–141.
- Srinivasan M, Wilkes M, Stevenson F, Nguyen T, Slavin S. 2007. Comparing problem-based learning with case-based learning: effects of a major curricular shift at two institutions. *Acad Med*. 82:74–82.
- Thomas RE. 1992. Teaching medicine with cases: student and teacher opinion. *Med Educ*. 26:200–207.
- Tyler RW. 1949. *Basic principles of curriculum and instruction*. Chicago (IL): University of Chicago Press.
- Williams JW, Simel DL. 2009. Does this patient have sinusitis? In: Simel DL, Rennie D, Keitz SA, editors. *The rational clinical examination: evidence-based clinical diagnosis*. New York: McGraw Hill Medical.
- Ziv A, Ben-David S, Ziv M. 2005. Simulation based medical education: an opportunity to learn from errors. *Med Teach*. 27:193–199.